



## ***STEEL POSTS FOR MARKERS AND DELINEATORS FIELD SECTION 1044***

**1044.1 Scope.** To establish procedures for inspection of galvanized steel posts used for mounting mile and object markers, delineators, drain and right-of-way markers and other similar purposes.

### **1044.2 Apparatus.**

- (a) Balance or scale accurate to within 0.5 percent of the weight [mass] of the sample to be weighed.
- (b) Magnetic Gauge, reading range 0-40 mils [0-1000  $\mu\text{m}$ ].
- (c) Rule with suitable graduations to accurately measure the material to be inspected.
- (d) Micrometer or vernier caliper capable of measuring to 0.0001 in. [0.00254 mm] and accurate to within at least 0.001 in. [0.0254 mm].

**1044.3 Procedure.** These posts are to be inspected for shape, length, weight [mass], fabrication, and galvanized coating. For field inspection purposes, the minimum number of posts inspected should be three for lots of 100 posts or less and one additional post for each additional 100 posts in lots larger than 100. A lot shall be considered that quantity of material offered for inspection at one time and of the same size and shape. Samples may be submitted to the Laboratory when field inspection indicates questionable compliance. A sample for Laboratory testing shall consist of two complete posts per lot.

### **1044.3.1 Mile and Object Marker, and Delineator Posts.**

**1044.3.1.1** The required shape, length, weight [mass], and hole punching diagram for mile marker and delineator posts may be found on Standard Drawing 903.03. The inspector should be aware that minimum and maximum weights [masses] and shape dimensions found on the Standard Drawing are absolute and no additional tolerance is allowed. The specified weight [mass] of these posts is before galvanizing and before fabrication. Therefore, if the posts are weighed after fabrication and galvanizing and the weight [mass] per linear foot [meter] is found to be at the specified limit or slightly out, the weight [mass] of the steel in the post will have to be calculated by adding the theoretical weight [mass] of the steel punched out to form the holes and deducting the theoretical weight of the galvanized coating. An example calculation is shown in paragraph 1044.4 of this Section.

**1044.3.1.2** Field determination of weight [mass] of coating is to be made on each lot of material furnished. The magnetic gauge is to be operated and calibrated in accordance with ASTM E376. Specimens for field testing are to be selected from each lot at the frequency shown in paragraph 1044.3 of this Section. A single-spot test is to be comprised of five readings of the magnetic gauge taken in a small area and averaged to obtain a single test result. Three such areas should be tested, one area near each end and one near the center. This would yield three single-spot test results for that specimen. Average the three test results to obtain the average coating weight [mass] for that specimen. Average all test results from all specimens to obtain the average coating weight [mass] to be reported. The minimum result would be the lowest average coating weight [mass] found on any one specimen. Material may be accepted or rejected for galvanized coating on the basis of magnetic gauge results. If a test result fails to comply with the specifications, that lot should be resampled at double the original rate. If any of the resamples fail to comply with the specifications, that lot is to be rejected. The contractor or supplier is to be given



the option of sampling for Laboratory testing if the magnetic gauge test results are within minus 15 percent of the specified coating weight [mass].

**1044.3.2 Drain and Right-of-Way Markers.** Steel posts for drain and right-of-way markers are to be of channel or modified channel shape and of the length shown on the plans or Standard Drawing 602.00. Weight [mass], hole punching details, and tolerances for weight [mass] and length are to be inspected for conformance to Specification Sec 1044.3.2. Field inspection procedures, minimum number of posts selected for field inspection and sampling for Laboratory testing are the same as shown in paragraph 1044.3 of this Section.

**1044.4 Calculations.** Shown below is an example calculation for determining, after fabrication, the mass per meter of a galvanized steel post.

**(a) Values Determined by Test.**

Average mass of zinc coating = 605 g/m<sup>2</sup>

Number of punched holes = 3

Diameter of holes = 8 mm

Total Mass of post = 5 kg

L = Length of post = 2400 mm

T = Thickness of channel = 4 mm

A = Overall height of channel = 32 mm

B = Overall width of channel = 56 mm

C = Width of outside face of channel bottom = 25 mm

D = Length of channel leg = 16 mm

**(b) Calculated Surface Area of Channel.**

$$\begin{aligned} W &= \text{Width of channel} \\ &= 2(D) + 2(A-T) + C - 2(T) \\ &= 2(16) + 2(32 - 4) + 25 - 2(4) \\ &= 105 \text{ mm} \end{aligned}$$

$$\begin{aligned} \text{Surface area} &= 2(W \times L) = 2(T \times L) \\ &= (2 \times 105 \times 2400) + (2 \times 4 \times 2400) \\ &= 523,200 \text{ mm}^2 \\ &= 0.523 \text{ m}^2 \end{aligned}$$

**(c) Calculated Total Mass of Zinc.**

$$\begin{aligned} \text{Total Mass of Zinc} &= (\text{Surface Area}) \times (\text{Avg mass per sq meter of zinc coating}) \end{aligned}$$

$$\begin{aligned} \text{Total Mass of Zinc} &= (0.523 \text{ m}^2) \times (605 \text{ g/m}^2) \\ &= 316.5 \text{ g} \end{aligned}$$

**(d) Calculated Mass of Steel Punched Out.**

$$\begin{aligned} \text{Area of one hole} &= \frac{3.1416 \times (\text{Diameter})^2}{4} \\ &= \frac{3.1416 \times (8)^2}{4} \end{aligned}$$



$$= 50.265 \text{ mm}^2$$

Volume of  
steel for  
one hole

$$= (\text{Area of one hole}) \times (T)$$

$$= 50.265 \times 4$$

$$= 201.06 \text{ mm}^3$$

(Steel weighs 7840 Kg/m<sup>3</sup>)

Mass of =  
steel from  
three  
punched  
holes

$$3 \times 7840 \text{ Kg/m}^3 \times 201.06 \text{ mm}^3$$

$$= 4.73 \text{ g}$$

**(e) Calculated Mass per Linear Meter.**

Mass per =  $\frac{\text{Post mass-Zinc Mass+Punchout Mass}}{\text{Length of post}}$   
linear meter  
of steel post

$$= \frac{5 \text{ kg} - 316.5 \text{ g} + 4.73 \text{ g}}{2400 \text{ mm}}$$

$$= 1.95 \text{ kg/meter}$$

**1044.5 Report.** Form T-739 is to be used both as an identification form for submitting samples to the laboratory and as a field inspection report. If a sample is submitted to the Laboratory for testing, a completed and signed Form T-739 shall accompany the sample. The Laboratory will perform the designated tests, complete the report form, and distribute the necessary copies. The report is to indicate acceptance, qualified acceptance, or rejection. Appropriate remarks, as described in [General Sec 7.1.2](#) of this Manual, are to be included in the report clarify conditions of acceptance or rejection. If all tests are performed in the field, the inspector shall strike out "Materials Engineer" and substitute his title, and sign the report. Distribution of the report is to be according to Class A in [General Sec 7.1.7.1](#).

Distribution of reports for materials purchased under a Department purchase order is to be as described in [Field Sec 2001](#) of this Manual.